

More profit from nitrogen

Increasing nitrogen use efficiency in dairy pastures

This project aims to increase nitrogen use efficiency (NUE) in dairy pasture systems where direct loss of nitrogen (N) has been assessed at levels as high as 40%. Previous farm scale work has suggested that small improvements in NUE can provide substantial productivity and profit gains for farm businesses. Recent dairy research in N cycling and loss processes have identified a number of options to increase NUE. Further testing and validation of these opportunities will be undertaken by this project. Led by Queensland University of Technology and assisted by the NSW Department of Primary Industries, the project will demonstrate ways in which increased NUE, together with greater water use efficiency (WUE), can provide win-win opportunities for farmers in both environmental and business sustainability improvements.



The research aims

The project aims to test and validate practices to improve NUE and WUE whilst reducing the carbon footprint and increasing the productivity and profitability of Australian dairy farms. Research will:

- Investigate the interactions between nitrogen, mineralisation and irrigation management and develop best management practices (BMP).
- Increase industry understanding of N losses, particularly from denitrification, and the potential for precision irrigation management to optimise NUE and WUE.
- Develop efficient strategies for reducing denitrification and total soil N losses and optimise synthetic fertiliser inputs.
- Produce recommendations for farmers detailing the optimal application timing and rates of enhanced efficiency fertilisers (EEFs) based on prevailing and predicted climatic conditions.

Methodology

The project is conducting two key activities:

1. Establishment of two core replicated trial sites – one each in the subtropical and hot/dry dairy regions and several satellite farmer based demonstration and research sites:

- The core sites will utilise existing research infrastructure currently operating at Casino (QUT) and Camden (NSW DPI) including variable rate irrigation, intensive soil moisture monitoring equipment and automated chambers.
- They will provide a testbed for BMPs and accurate quantification of N loss pathways under a suite of different nitrogen, irrigation and EEF management practices.
- Determine the key processes of N cycling (mineralisation,

denitrification and total N recoveries) using ^{15}N labelled fertilisers, soil and plant recoveries and field based mass spectrometer and pasture productivity under different treatments.

- Quantify total denitrification losses (N_2O and N_2) using highly enriched (99%) ^{15}N fertiliser and total GHG's using automated chamber technology.

2. Use data and process understanding from activity 1 to test potential BMPs and develop industry benchmarks for NUE:

- Measure N cycling and efficiency over 2 years
- Measure agronomic efficiency with outputs in units of pasture DM/kg N/ L water

Extending the outcomes

Findings will be disseminated to the research, industry and agronomy communities through scientific papers and conference presentations. Outcomes will be presented to farmers at on-farm field days at Casino and Camden as well as through Dairy Australia's programs and resources. ■■



For more information contact:
Dr David Rowlings, Queensland University of Technology
T +61 7 3138 9508 E d.rowlings@qut.edu.au

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